8 Support Programs

Previous sections of this Plan have described the Bureau of Watershed Management's core elements of Resource Protection, Monitoring, Pollution Control and Infrastructure. There are several support programs that enable these efforts and enhance their effectiveness. These support programs utilize the Bureau's wealth in both professional staff expertise and natural resources.

Offering technical assistance to local communities has been a strategy of the Bureau's watershed protection program since the initial 1991 Watershed Protection Plan. Public education and community outreach are effective ways to promote protection of the watershed's natural resources. Geographic Information Systems (GIS) – the sophisticated computerized integration of maps and data – has become the base for many of the Bureau's endeavors, as well as an important tool for local planning initiatives and administration. The vast amount of water and land under the Bureau's control is an invaluable resource for scientific study. Research projects performed on BWM property provides critical insight into the region's ecosystem, which is useful for both short-term watershed management goals and long-term biodiversity health.

8.1 Community Technical Assistance

Accomplishments:

- Provided direct Technical Assistance to local boards of health, conservation commissions, and planning boards by BWM staff during their meetings, through attending meetings, telephone conversations, on site visits and with GIS products.
- Tracked changes in local bylaws.
- Completed contracts for Boylston Master Plan, Rutland Master Plan, Sterling and Paxton Open Space Plans. A contract with a coalition of local Town representatives led to the successful completion of the Household Hazardous Products Committee project.
- Developed and implemented a formal contract program for the entire Watershed System. Four Wachusett Reservoir watershed towns received $36,000 in the program's first year.

Assessment:

Most of the specific planning and regulatory tools and techniques that comprise watershed protection (for areas outside direct BWM jurisdiction) must be adopted at the municipal level through town meetings and enforced by local volunteer boards. BWM recognizes the unique "home rule" land use authority vested in Massachusetts municipalities and continues to use its expertise and resources to support local officials' decision making.

Key Actions:

- Continue board assistance through regular contact with members.
- Continue to solicit from local Boards and Commissions any interests they may have in certain areas where BWM staff are able to assist (i.e., plan review, stormwater, etc.).
- Pursue continued funding for Technical Assistance Contract Program for watershed towns.
- Monitor proposed bylaw changes.
- Provide technical information that will be of interest to watershed communities.

Background

In the Commonwealth of Massachusetts, municipalities have significant authority over land use and development. Towns are authorized to enact and enforce a variety of statutes, including zoning bylaws, subdivision bylaws, and overlay districts (such as aquifer protection bylaws). In addition, the state delegated partial authority for regulations such as Title 5 and the Wetlands Protection Act to municipal governments.

Volunteer boards are responsible for these bylaws and regulations. These boards include: the local boards of health, conservation commissions, and planning boards. Tasks that board members must perform include reviewing proposals, commenting, determining if the applicable standards are met, issuing approvals or permits, and supervising construction and other on-site compliance reviews. In many towns, especially small ones, there are few paid professional positions, and the boards may not have town staff to support them. Further, the board members may or may not have received training in that technical area. The BWM's community technical assistance program seeks to maximize the watershed protection afforded under locally delegated controls.

The BWM historically maintained contact with local boards, through the review of major development proposals, construction site inspections, and other situations pertaining to compliance with state and federal regulations. Through these efforts, the agency helped address a range of water supply pollutants, such as septic systems, sedimentation from construction, road drainage, stormwater runoff from residential area, and recreational field runoff.

The 1991 Plan established a goal to "encourage local land use controls." The 1991 Plan focused on technical assistance in part because the passage of the WsPA, which would give MDC direct regulatory authority over land uses and activity in critical zones, was not yet assured. The 1993 Addendum to the 1991 Plan reiterated this goal and refined the need for the DWM to "encourage and support the adoption of stronger local bylaws and regulations" and "provide local assistance and develop model bylaws." To establish effective local land use controls, DWM would provide technical assistance and funding.

MDC's involvement in local planning and environmental issues was greatly expanded with the passage of the WsPA in 1992 (**see Section 5.2.1**). The WsPA specifically required a program of technical assistance to affected communities. The WsPA directed MDC to "provide a program for technical assistance to communities impacted by this act" that includes, but is not limited to, "planning studies, and zoning bylaw studies, health bylaw studies and subdivision by-law studies" (MGL c. 92, s.108).

From 1992 to 1998, over $400,000 in direct funding, plus DWM staff time through the Environmental Planning and Environmental Quality sections, was committed to technical assistance. This outreach affected every community in the Wachusett Reservoir watershed. Through these efforts, DWM established an effective presence at local board meetings, sparked local efforts to improve bylaws, and provided training to local officials.

The BWM Technical Assistance Program encompasses the following types of activities:

1. Growth management planning, master plans, and land use studies.
2. Review, revision, and development of by-laws, subdivision and other regulations, protective districts, and performance standards.
3. Refinement of local monitoring, review, permitting, and enforcement practices.
4. Design advice to municipal boards or landowners from natural resource, engineering, and planning professionals.
5. On-site reviews of proposed development projects with local board members and municipal officials.
6. Public education programs.
7. Applied watershed management research.
8. Technology transfer.
9. Coordinating program topics and audiences with other technical assistance organizations (such as watershed associations).

Current Program and Accomplishments

The Technical Assistance Program provides the watershed communities three different avenues to obtain help with their local land use regulatory needs:

- Board Communication
- In-House Projects
- Technical Assistance Contracts

Board Communication

Attendance at local board meetings is an effective way to foster good communication between BWM and the watershed communities. BWM presence offers both regulatory review and the opportunity to provide immediate technical assistance and, if need be, the recommendation for more in-depth consultation.

Due to fiscal constraints, attendance at local board meetings has been constrained to an as-needed basis. BWM staff have initiated a process to maintain effective communication with local boards during scheduled office hours. Direct technical assistance – reviewing project proposals, helping interpret local and state regulations, etc. – is provided during meetings, through telephone and e-mail conversations and on-site visits.

In-House Projects

There are some instances where a town requires more than a conversation to help with a project. In cases where BWM staff have time and resources, the agency provides in-house support; these projects are often associated with GIS analyses (**see Section 8.2**). It was the Bureau's experience, however, that most projects for which the towns seek assistance are too large or complicated for staff resources. The Technical Assistance Contract Program was organized to facilitate BWM sharing its financial resources with the watershed communities (see the next sub-section for a description of the projects funded through this program). Prior to 1998, the Bureau sponsored the complete costs for a

regional Household Hazardous Waste Collection in the Wachusett Reservoir watershed (**see Section 6.3.2**). Since 1998, MDC provided some of the set-up costs for these collections, which are held in Holden but are open to all residents of Boylston, Holden, Paxton, Princeton, Rutland, Sterling, and West Boylston. Over the last few years these collections have become self-supporting.

Technical Assistance Contracts

There are many land use planning projects that communities want to initiate that are beyond their financial means. Throughout the 1990s, the MDC, upon the request of a watershed town, would support a study or plan if finances were available. These major projects included Master Plans for Boylston and Rutland, Subdivision Regulations for West Boylston, and an Open Space Plan for Princeton.

A critique of these efforts was that the funds were distributed on a first-come, first-serve basis and that some towns were not obtaining this financial support. The 1998 Plan identified the need for a competitive program to distribute Technical Assistance contracts. Staff established a process that was implemented in FY2002.

Eleven applications from the entire watershed system, totaling $327,644, were submitted for an estimated $150,000 available in funding. Nine projects were eventually chosen, totaling $151,000; five towns are in the Wachusett Reservoir watershed (**see Table 8-1**). Some towns were able to utilize these technical assistance contracts to enhance the money available through Executive Order 418 (Planning for Growth) to develop Master or Comprehensive Plans. Funds were not available to finance a second round of applications in FY2003.

Table 8-1
FY2002 Technical Assistance Contracts – Wachusett Reservoir Watershed

Town	Type of Project	Grant Amount	Total Project Costs
Holden	Unified Stormwater Regulation Development	$15,000	$20,000
Paxton	Open Space and Recreation Plan	$5,000	$10,000
Rutland	Contract for a Planning Agent to Assist in Implementation of Master Plan	$25,000	$40,000
Sterling	Open Space and Recreation Plan	$6,000	$12,000
West Boylston	Comprehensive Plan	$10,000	$75,000
TOTAL		**$61,000**	**$157,000**

Source: DCR/DWSP/BWM Planning, 2003

Training

Staff use the existing network of active citizens from watershed towns and boards to share information, keeping BWM staff apprised of immediate training and technical assistance needs.

Some of the key committees and groups that have historically been involved in providing technical assistance to municipalities include:

- Water Supply Citizens Advisory Committee
- Wachusett Board of Health Coalition
- Wachusett Household Hazardous Products Committee
- Wachusett/Sudbury Advisory Committee (Watershed System Advisory Committee)
- Citizens Planning Training Initiative (statewide)
- Nashua River Watershed Association.

Assessment

BWM recognizes the unique "home rule" land use authority vested in Massachusetts municipalities. Most of the specific planning and regulatory tools and techniques that comprise watershed protection (for areas outside direct BWM jurisdiction) must be adopted at the municipal level through town meetings and enforced by local volunteer boards. Thus, to accomplish the goal of utility and to improve local programs for water protection, BWM adopted the role of advocate and advisor.

By working with watershed area officials and citizens, BWM can successfully find common ground on resource protection issues. These projects help both local resources and the Metropolitan Boston water supply. The technical assistance program emphasizes local source protection and its immediate impact to watershed residents and decision-makers. Through this cooperative approach, BWM improves the land-use planning, control of development, and general environmental protection at the local level, which ultimately benefits the Bureau's drinking water source protection. It is, however, the town's responsibility to adopt and implement any plan or bylaw.

These support programs for the watershed communities has unfortunately faced budget restrictions due to recent fiscal constraints. BWM staff have not had the resources to regularly attend night meetings, significantly reducing face-to-face contact with many volunteer board members. Alternative communication has been arranged, such as review of projects during business hours and increased use of e-mail and voice-mail. When the budget allows an increase in spending, the Bureau will send staff to attend selected meetings.

The Technical Assistance Contract Program was also a casualty of the reductions in the FY2003-2004 budgets. The program's implementation strategy has been established, so it can be re-started once funds become available. The communities often turn to the two Regional Planning Agencies within the watershed – Central Mass. Regional Planning Commission and Montachusett Regional Planning Commission – to perform these planning tasks. The Bureau should further strengthen its relationships with the RPAs in order to promote water supply protection strategies. A status report on each watershed town's planning and bylaws, updating the 1993 MDC funded a report "Watershed Protection for Towns: Analysis of Existing Bylaws," would be an opportunity to open the BWM – RPA dialogue. The increased priority of stormwater planning (**see Section 6.2**), with the dedication of Bureau resources towards assisting towns on their "Phase II" planning and implementation, will provide additional opportunities for communication and cooperative strategies in the watershed.

Control Approach

Goals

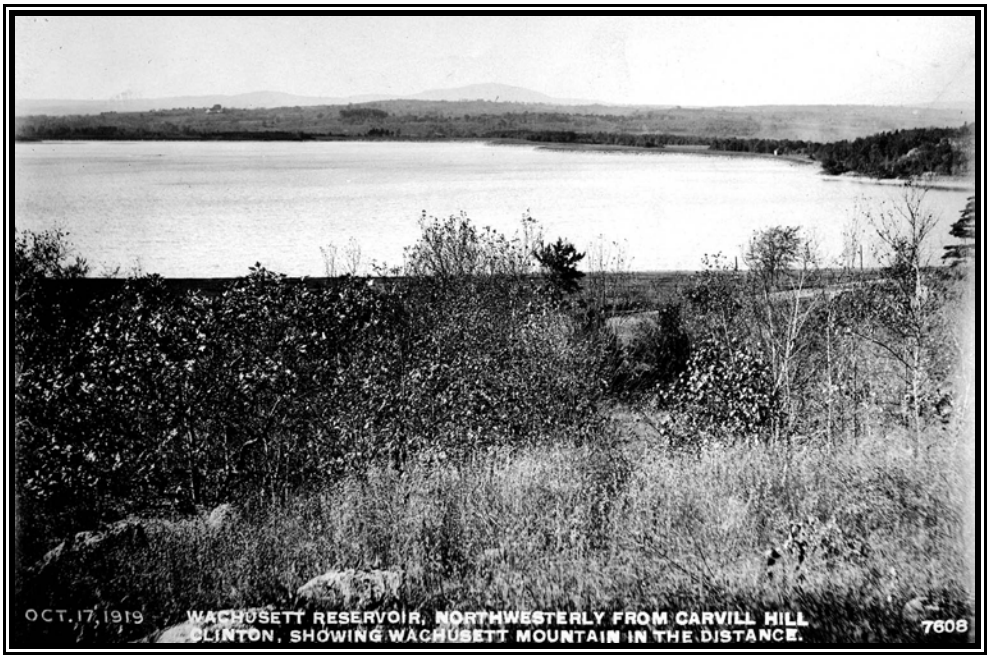
- To improve the watershed protection afforded by local land use control programs.

Objectives

- Continue an active presence within watershed communities, specifically at local board meetings, providing professional review on matters relating to watershed protection.
- Provide and coordinate training opportunities for local board members and town personnel responsive to needs and relevant to water quality protection.
- Implement and fund a contract program for the distribution of BWM's technical assistance funds.
- Coordinate funding and technical assistance with other agencies.

Action Items

- Continue regular communication with local boards. Maintain communication with boards of health, conservation commission, planning boards, public works departments and boards of selectmen.
- Provide direct technical assistance support, as requested, to local boards and community organizations.
- Implement Technical Assistance Contract Program to strengthen local planning capability.
- Track changes in local bylaws for watershed protection through regular communication with towns and Regional Planning Agencies.



8.2 Public Education and Community Outreach

Accomplishments:

- Watershed Rangers presented close to 200 programs to children in the watershed and created a watershed protection display and program for use in fairs and other public events.
- Developed a pilot curriculum for fourth grade students in the Wachusett Reservoir watershed.
- Continued involvement in teacher training, including responsibility for the Massachusetts Project WET program, assistance in the Wachusett Region Environmental Educators Network (WREEN) and participation in the Massachusetts Drinking Water Education Partnership (MADWEP).
- Developed an interpretive trail at the Stillwater Farm.
- Published seven Fact Sheets regarding watershed protection programs, eight editions of the *Downstream* newsletter, and instituted the Bureau's website.
- Erected numerous kiosks and bulletin boards around the reservoir to provide information and educational materials for visitors.

Assessment:

BWM has an established program of public education for students, local residents and visitors on importance of watershed and resource protection. Education is provided in a variety of ways, using direct and indirect contact with individuals and groups. Direct contact includes educational programs through local schools, interpretive programs on BWM properties and education by rangers through casual contact with visitors. In addition, staff provide training for teachers in watershed education. Indirect education occurs through the use of kiosks, bulletin boards and signs, the *Downstream* newsletter and other publications, and the BWM website.

Key Actions:

- Continue to develop, implement, and expand curriculum developed for the Wachusett Regional School District.
- Continue to manage Project WET and support other state environmental programs including Project WILD, Project Learning Tree and the Envirothon.
- Continue to offer in-school and field programs to watershed school systems.
- Develop programs and exhibits at Stillwater Farm.
- Expand use of kiosks and bulletin boards to educate visitors.
- Prepare outreach materials for the general public and media on DCR and general watershed topics.
- Continue to develop website to provide educational resources on watershed management topics.
- Continue publication of the *Downstream* newsletter. Assess topics and distribution process.

Background

Educational programs are an effective way to protect watershed resources by instilling a better understanding and appreciation of stewardship of natural resources. Many water suppliers incorporate interpretive services into their watershed protection programs to enhance their message of water quality and resource protection. The BWM has effectively used public education to enhance its watershed protection for many years, providing outreach and education throughout its watershed system to residents, students, teachers, public officials and visitors. The Quabbin Visitors Center, established by the Legislature in 1985, had served as the major avenue for information and

education about the watershed system. The relatively recent development of the Watershed Ranger program has broadened the scope of the education efforts by providing a venue for a program in the Wachusett Reservoir watershed.

The 1991 Watershed Protection Plan began the formulation of a more expansive outreach program. Although education was not listed as a specific program, the Plan did provide for technical assistance on a number of topics within the action items. The 1996 Wachusett Public Access Plan further expanded public education in calling for development of a Ranger staff that would provide education on rules enforcement and watershed protection through contact with visitors to watershed properties. The 1998 Wachusett Reservoir Watershed Protection Plan formalized the public education program and set forth goals for public education and interpretive services.

Current Program and Accomplishments

Public Education

School programs have been shown to be an effective method for disseminating environmental education. BWM has made education through schools an important component of its resource protection program. BWM has been involved in several education networks, including Massachusetts Drinking Water Education Partnership (MADWEP) and Wachusett Region Environmental Educators Network (WREEN). The Bureau has been the state sponsor of Project WET (Water Education for Teachers) since 1996, providing the administrative staff for this national program. There are currently 102 facilitators in the Project WET network. From 1998 to 2003, the Bureau has held 122 workshops, training 1,757 teachers to use Project WET materials. Watershed Rangers and other staff have themselves provided hundreds of programs in watershed schools over the years. General public education focuses not only on Ranger contact with visitors but also includes the development and use of a watershed protection display and program for fairs and other public events, the utilization of kiosks and bulletin boards around the reservoir to disseminate information and educational materials, and the use of written publications and the agency's website.

Stillwater Farm

The Stillwater Farm site provides a unique opportunity to visually and programmatically demonstrate the relationship between land use and water quality. This historic property was originally settled in 1790 and grew at one point to a 300 acre dairy farm with a unique salt box barn. Approximately 230 acres of the farm site were purchased by the MDC in 1990 for watershed protection purposes after they were placed on the market for commercial and residential development. The property is situated atop the Stillwater Aquifer, the largest in the watershed, and much of the land abuts the Stillwater River. Shortly after its acquisition, MDC entered into a partnership with The Friends of Wachusett, a non-profit organization, to develop a watershed interpretive site that preserves the farm's natural and historic resources.

Plans for Stillwater Farm include renovation of the home and barn as well as landscape level educational opportunities. BWM has established a woodland interpretive trail that demonstrates forest succession; future exhibits could include a wetland and floodplain delineation trail, interactive groundwater monitoring wells, or an outdoor soil profile display. The Friends of Wachusett and BWM have received over $200,000 in grants and donations, including a recent $6,000 grant for curriculum development from the Natural Heritage Trust.

Stillwater Farm.

Community Outreach

BWM staff prepared seven fact sheets on a range of topics related to the Bureau's activities, including: Hazardous Materials, Land Acquisition, Public Access, Silviculture, Water Quality, Watershed Protection Act, and Wildlife Control. A primer on Growth Management Tools was also produced and distributed by the Bureau. The Natural Resources Section initiated a semi-annual newsletter, *Downstream*, which presents topics of interest to landowners in Central Massachusetts, such as Invasive Species, Conservation Restrictions, and Green Landscaping. It is mailed to all landowners of 10 acres or more in the watershed system. All of the fact sheets, newsletters, and other watershed management related materials have been posted on the agency's website.

Assessment

BWM has developed and implemented a strong program of public education for students, local residents and visitors that focuses watershed and resource protection. The Watershed Rangers and other staff offer educational programs through local schools, interpretive programs on BWM properties and casual contact with visitors. The rangers ability to provide in-school lessons has been curtailed due to the increased need for their security functions. Stillwater Farm is being developed for educational use through a Memorandum of Agreement with the Friends of Wachusett, a non-profit community organization. Once renovations are completed in 2003, the farm house will be used as an interpretive center.

DCR staff provide a significant role in training teachers in watershed education curriculum through the statewide coordination of ProjectWET. Public outreach, through the use of kiosks, bulletin boards, signs, the *Downstream* newsletter, referral or dissemination of technical publications, and the BWM website, is an important process in the ongoing effort to involve all citizens, both residents and visitors, in contributing to watershed protection.

Control Approach

Goals

- To foster an attitude of stewardship of the land and water resources of the watershed system among area residents, businesses and visitors.
- To promote an understanding of the physical, chemical, and biological properties and functions of surface water, groundwater, wetlands, and aquifers, as well as the relationship between land use and water quality.
- To promote widespread knowledge of, and voluntary compliance with, BWM's Rules and Regulations and the public health significance of these rules.

Objectives

- Provide in-school programs to educate children on watershed management issues.
- Facilitate other parties to provide water supply protection educational materials.
- Educate the public about watershed management topics and BWM's Rules and Regulations through both direct and indirect methods of communication.
- Utilize Stillwater Farm as an interpretive center.

Action Items

- Continue to develop, implement, and expand curriculum developed for the Wachusett Regional School District.
- Continue to manage Project WET and support other state environmental programs including Project WILD, Project Learning Tree and the Envirothon.
- Continue to offer in-school and field programs to watershed school systems.
- Develop programs and exhibits at Stillwater Farm.
- Expand use of kiosks and bulletin boards to educate visitors.
- Prepare outreach materials for the general public and media on DCR and general watershed topics.
- Continue to develop website to provide educational resources on watershed management topics.
- Continue publication of the *Downstream* newsletter. Assess topics and distribution process.

8.3 Geographic Information Systems

Accomplishments:
- Provided mapping and data information to all BWM Sections, including Natural Resources, Environmental Quality, Forestry, Education and the Sewer Project.
- Assisted local municipalities and non-profit organizations with map products to aid projects in the watershed that will enhance water quality.
- Developed map and data information request protocol for use by staff, municipalities and other watershed partners.

Assessment:
The functions of the GIS Department are an integral part of all the other BWM sections. The maps and analysis produced by the GIS staff provide other Bureau staff with the information necessary to complete their tasks in an accurate and timely manner. In addition, watershed towns and non-profit organizations are able to benefit from this information.

Key Actions:
- Update digital information, including all new BWM land purchases, Watershed Protection Act maps and parcels, and provide analyses for use in Bureau reports and publications.
- Continue support to municipalities and non-government organizations by providing GIS products and technical assistance.
- Continue to update the Wachusett Reservoir Watershed Land Acquisition Model to determine priority land for purchase.

Background

A geographic information system (GIS) is a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information (i.e., spatial data). This system includes hardware (computers, printers, plotters, scanners, digitizers, GPS units, etc.), software (programs like ArcInfo and ArcView), data (roads, town boundaries, parcels, aerial photographs, etc.), and staff. A GIS belongs to a family of mapping and drafting programs that includes computer-aided design (CAD) and automated mapping and facilities management (AM/FM); it is distinguished from these other programs by its capacity to perform complicated analytical functions that often include combining information from different sources to derive meaningful relationships.

The Division of Watershed Management initially used GIS for creating rudimentary maps in the 1991 Watershed Protection Plans. The passing of the Watershed Protection Act (WsPA) in 1992 forced DWM to quickly evolve its GIS program. The WsPA required the Division to develop GIS maps for the watershed system that would enable the identification of both regulatory buffers and affected landowners. At that time, the utilization of GIS for defining regulatory areas was a state-of-the-art application. The Division subsequently used its GIS to create a Land Acquisition Prioritization model. Integrating a range of criteria through an Analytical Hierarchy Process, the GIS was able to take advantage of accurately computerized topography, hydrology, land use and ownership data to establish a process that maximized the funds spent on land acquisition.

The Bureau has worked closely with MassGIS, the Commonwealth's Office of Geographic and Environmental Information, which is within the Executive Office of Environmental Affairs.

MassGIS, created in the late 1980s, is the official state agency assigned to the collection, storage and dissemination of geographic data. The collaboration between BWM and MassGIS has provided the technical support necessary for the Bureau to maintain a high level of GIS services.

Current Program and Accomplishments

The BWM GIS staff are continuously manipulating data to support the various needs of the Bureau. All applications submitted for the Watershed Protection Act have a map produced depicting the parcel location and its WsPA regulatory buffers (**see Section 5.2.1**). Maps and analyses have been produced on a regular basis to help with the forestry, wildlife management, land acquisition, environmental quality monitoring, and education elements of the Bureau. The GIS staff worked closely with other staff to produce Emergency Response reports, the Wachusett Reservoir Land Management Plan, the Wachusett Reservoir Watershed Public Access Plan Update, and this Watershed Protection Plan Update. ArcView GIS software and training were deployed throughout the Bureau, enabling all professional staff to have access to GIS maps and information. The GIS program assures that quality standards are met for all the data maintained by BWM.

BWM also offers its GIS services to watershed communities, supporting the efforts of planning boards, conservation commissions and open space committees with maps and digital information. This technical assistance is also provided to local non-governmental organizations, such as land trusts and greenway committees. The Bureau receives, on average, one request per month for services such as site suitability maps, zoning maps, Watershed Protection Act maps, and digital data for planning initiatives. A protocol was established in 2002 to properly manage these requests from outside the Bureau.

The GIS Staff work toward better understanding their constantly changing field by regularly attending regional GIS User Conferences. A bathymetric analysis of Wachusett Reservoir, utilizing data from the reservoir's construction, received accolades at the New England Arc/Info Users 2000 annual meeting. Participation in the Massachusetts Geographic Information Council's forum of GIS users provides the opportunity to share insights with professionals from across the state. Ongoing dialogue with MassGIS is critical to the success of this program.

Assessment

BWM's use of GIS technology offers vital support to staff and local municipalities, providing decision making tools, statistical analysis and map products to assist in forming and implementing management strategies and programs. The continued expansion, refinement and effective use of GIS capabilities are integral components of a comprehensive, well-reasoned approach to watershed management.

Control Approach

Goals

- To manage a Geographic Information System that provides the necessary data and analyses for the Bureau of Watershed Management to meet its water quality goals and regulatory requirements.

Objectives

- Maintain and update existing BWM specific data.
- Provide hardware and software to utilize geographic based data.
- Support BWM functions with GIS analyses and maps.
- Communicate effectively with MassGIS and other GIS users.

Action Items

- Update digital information, including all new BWM land purchases, Watershed Protection Act maps and parcels, and provide analyses for use in Bureau reports and publications.
- Continue support to municipalities and non-government organizations by providing GIS products and technical assistance.
- Continue to update the Wachusett Reservoir Watershed Land Acquisition Model to determine priority land for purchase.

8.4 Research Projects and Special Studies

Accomplishments:

- Continued commitment of staff time and funding for research on a variety of watershed issues including forest management, forest inventory, GIS Mapping, water quality, watershed and reservoir dynamics, stream gauging, watershed management methods and technologies, and wildlife populations.

Assessment:

It is important for watershed managers to keep up with developments in science and technology. Research provides tools for more efficient management and for improved response to ongoing changes in drinking water regulations. In addition, BWM is the steward for a unique resource that affords opportunity for many environmental research endeavors.

Key Actions:

- Support in-house research projects.
- Maintain an ongoing, cooperative research program between BWM and the University of Massachusetts, Amherst.
- Review requests by other institutions to participate in investigations of watershed issues.

Background

The BWM has a history of sponsoring research and special studies on a variety of watershed management issues. These research projects, on topics such as forest management, wildlife, and water quality, improved BWM's knowledge of the watershed system, its ecological processes, and management options.

Current Program and Accomplishments

Table 8-2 presents a summary of ongoing projects sponsored by the BWM in the Wachusett Reservoir watershed. BWM funded projects at the University of Massachusetts have subsequently led to two additional American Water Works Association Research Foundation (AWWARF) projects and a National Science Foundation project. The BWM has participated as a cooperating utility in additional AWWARF projects.

There are also several research initiatives led by BWM staff on water quality, forestry and wildlife topics. For example, over the last three years, Natural Resources staff have been monitoring wildlife resources on permanent plots. NR examines the small mammal, breeding bird, and reptile/ amphibian community at each plot. The goal of this long-term monitoring program is to assess changes in these communities over time with respect to the land management activities that take place. The monitoring program is scheduled to continue indefinitely.

Assessment

The protected land holdings of the Wachusett Reservoir watershed are a special environmental system. It is important that the BWM keep abreast of advances in watershed management practice and general environmental science. The agency has established relationships with UMass, Amherst and the U.S. Geological Survey (USGS). Other institutions are also able to request the opportunity to scientifically investigate topics of mutual concern. The Bureau's commitment to watershed and general environmental research projects has furthered watershed protection efforts and staff professional development.

Control Approach

Goals

- To use knowledge obtained from research and special studies to continuously improve watershed management programs and obtain improved water quality.

Objectives

- Apply knowledge gained from research projects and special studies by developing specific watershed management practices.

Action Items

- Continue to support research projects and special studies by UMass (Indicator Organisms, Watershed Modeling, Watershed Runoff, Reservoir Modeling) and USGS (Stream Gauging)
- Continue to support in-house research projects and special studies, including In-situ Reservoir Water Quality Monitoring, Macroinvertabrate Monitoring, Forest Mapping and Wildlife Studies.
- Review requests by other institutions to participate in investigations of watershed issues.

Table 8-2
DCR/MWRA Watershed Research Projects

Project	Research Organization	Summary
In-situ Reservoir Water Quality Monitoring	BWM and MWRA	Install and maintain two in-situ (real-time) water quality monitoring buoys. The data are used to track the Quabbin interflow.
Macroinvertabrate Monitoring	BWM	Monitor populations of aquatic insects in order to evaluate water quality in tributaries.
Indicator Organisms	UMass	Assess watershed runoff for bacteria and pathogens; make recommendations about designing optimum water quality sampling program. Additional funding was procured for these studies from AWWARF.
Watershed Modeling	UMass	Develop methods to track sources of high fecal coliform bacteria in order to remediate. Additional funding was procured for these studies from AWWARF and NSF.
Watershed Runoff	UMass	Modeling to predict impacts of land use on organic and precursor export; watershed and tributary modeling to predict tributary water quality.
Reservoir Modeling	UMass	Modeling of in-reservoir processes that affect water quality; develop predictive capabilities.
Stream Gauging	USGS	Maintain network of stream and rain gages in watershed.
Wildlife Studies	BWM	Monitoring surveys to determine the utilization of habitat by particular species of wildlife in locations with forest management activities.

Source: DCR/DWSP/EQ and NR, 2003

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